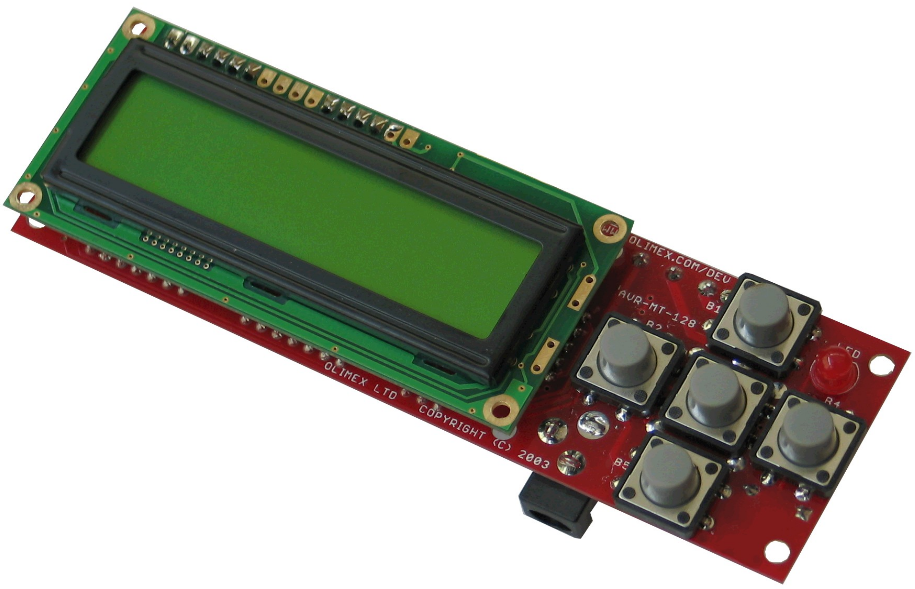


AVR-MT128 development board

Users Manual

Rev.A, July 2008

INTRODUCTION:

AVR-MT128 is simple but powerful board which uses the MCU ATMega128 from Atmel. With its LCD, buttons, relay and variety of interfaces such as RS232 (in two variants – 4 pins and DB9), JTAG, ISCP, Dallas, etc. this board is suitable for different embedded systems applications.

BOARD FEATURES:

- MCU: **ATMega128-16AI** with128K Bytes Program Flash, 4K Bytes data EEPROM, 4K Bytes RAM
- JTAG connector for in-circuit programming and debugging with AVR-JTAG
- ICSP 5x2 (10) pin STKxxx compatible connector for in-circuit programming with AVR-PG1B or AVR-PG2B
- RS232 connector with TTL levels
- RS232 interface circuit with Tx, Rx signals
- RS232 DB9 female connector
- Dallas touch button port
- Frequency input
- LCD 16x2 display
- Status LED
- Five buttons
- Buzzer
- Power supply circuit +5V, 78L05 with plug-in power jack and diode bridge
- 32 768 Hz oscillator crystal
- 16 MHz crystal oscillator
- Power supply filtering capacitor
- RESET supervisor IC ZM33064
- RELAY with 10A/250VAC NO and NC contacts with screw terminals
- Extension headers for unused in the schematic ports available for external connection
- PCB: FR-4, 1.5 mm (0,062"), green soldermask, white silkscreen component print
- Four mounting holes 3.3 mm (0.13")
- Dimensions: 120x38 mm (4.7x1.5")

ELECTROSTATIC WARNING:

The AVR-MT128 board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS:

Cables: RS232 straight male-to-female DB9 cable (Note: this is not a null modem cable)

Hardware: Programmer: AVR-PG1, AVR-PG2, AVR-ISP500, AVR-ISP500-TINY, AVR-ISP500-ISO or other compatible tool;
Debugger: AVR-JTAG, AVR-JTAG-USB or other compatible tool;

Software: AVR Studio + WinAVR – free C compiler and debugger can be downloaded at avrfreaks.org web site. IAR IW for AVR is a commercial software for development of embedded systems software.

PROCESSOR FEATURES:

AVR-MT128 uses ATMega128 MCU from Atmel with the following features:

- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
  - 133 Powerful Instructions – Most Single Clock Cycle Execution
  - 32 x 8 General Purpose Working Registers + Peripheral Control Registers
  - Fully Static Operation
  - Up to 16 MIPS Throughput at 16 MHz
  - On-chip 2-cycle Multiplier
    Nonvolatile Program and Data Memories
  - 128K Bytes of In-System Reprogrammable Flash
    Endurance: 10,000 Write/Erase Cycles
  - Optional Boot Code Section with Independent Lock Bits
    In-System Programming by On-chip Boot Program
    True Read-While-Write Operation
  - 4K Bytes EEPROM
    Endurance: 100,000 Write/Erase Cycles
  - 4K Bytes Internal SRAM
  - Up to 64K Bytes Optional External Memory Space
  - Programming Lock for Software Security
  - SPI Interface for In-System Programming
- JTAG (IEEE std. 1149.1 Compliant) Interface
  - Boundary-scan Capabilities According to the JTAG Standard
  - Extensive On-chip Debug Support
  - Programming of Flash, EEPROM, Fuses and Lock Bits through the JTAG Interface
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
  - Two Expanded 16-bit Timer/Counters with Separate Prescaler, Compare Mode and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Two 8-bit PWM Channels
  - 6 PWM Channels with Programmable Resolution from 2 to 16 Bits
  - Output Compare Modulator
  - 8-channel, 10-bit ADC
    8 Single-ended Channels
    7 Differential Channels
    2 Differential Channels with Programmable Gain at 1x, 10x, or 200x
  - Byte-oriented Two-wire Serial Interface
  - Dual Programmable Serial USARTs
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with On-chip Oscillator
  - On-chip Analog Comparator
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources

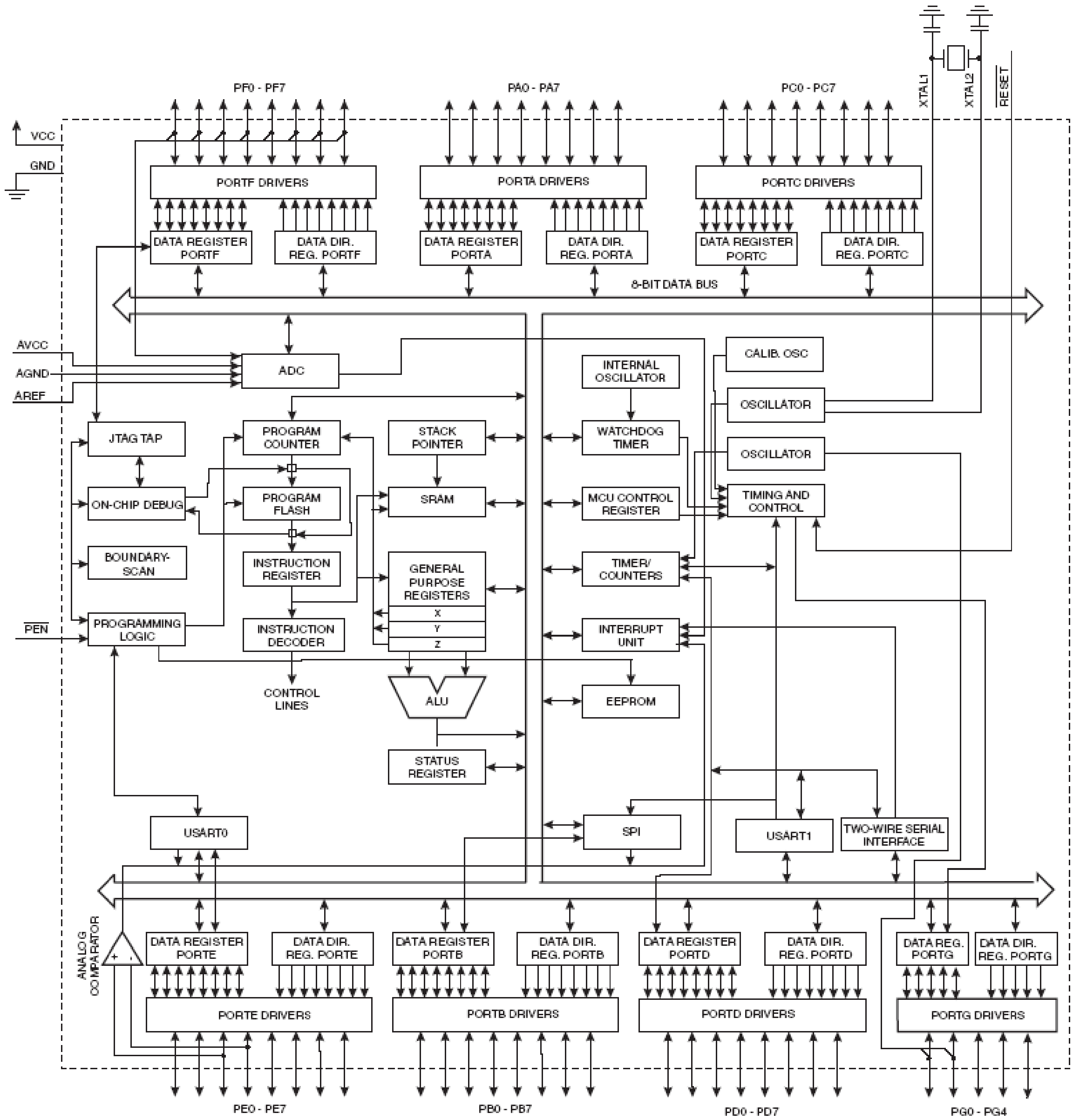
- Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- Software Selectable Clock Frequency
- ATmega103 Compatibility Mode Selected by a Fuse
- Global Pull-up Disable

– I/O and Packages
  - 53 Programmable I/O Lines
  - 64-lead TQFP and 64-pad MLF

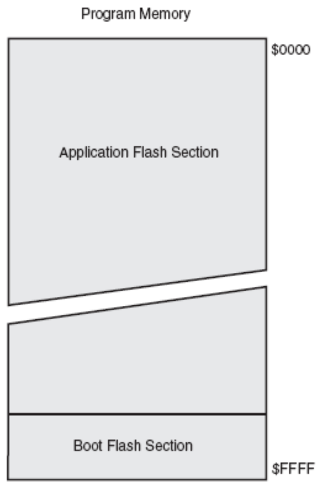
– Operating Voltages
  - 4.5 - 5.5V for ATmega128

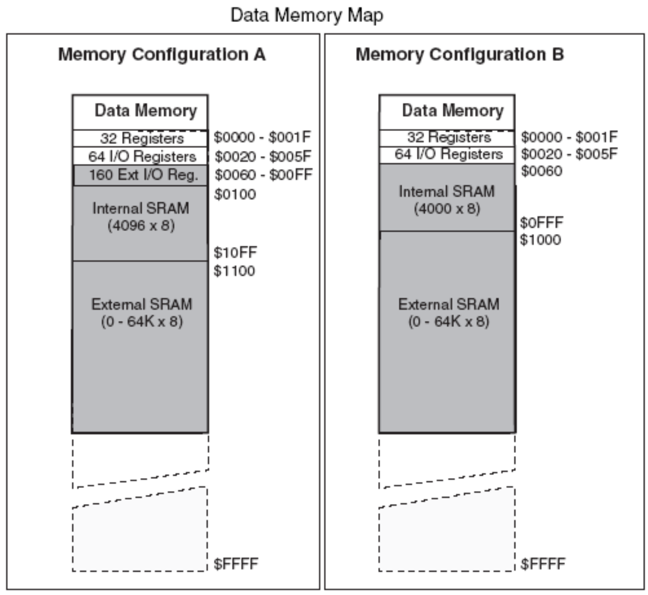
– Speed Grades
  - 0 - 16 MHz for ATmega128

BLOCK DIAGRAM:

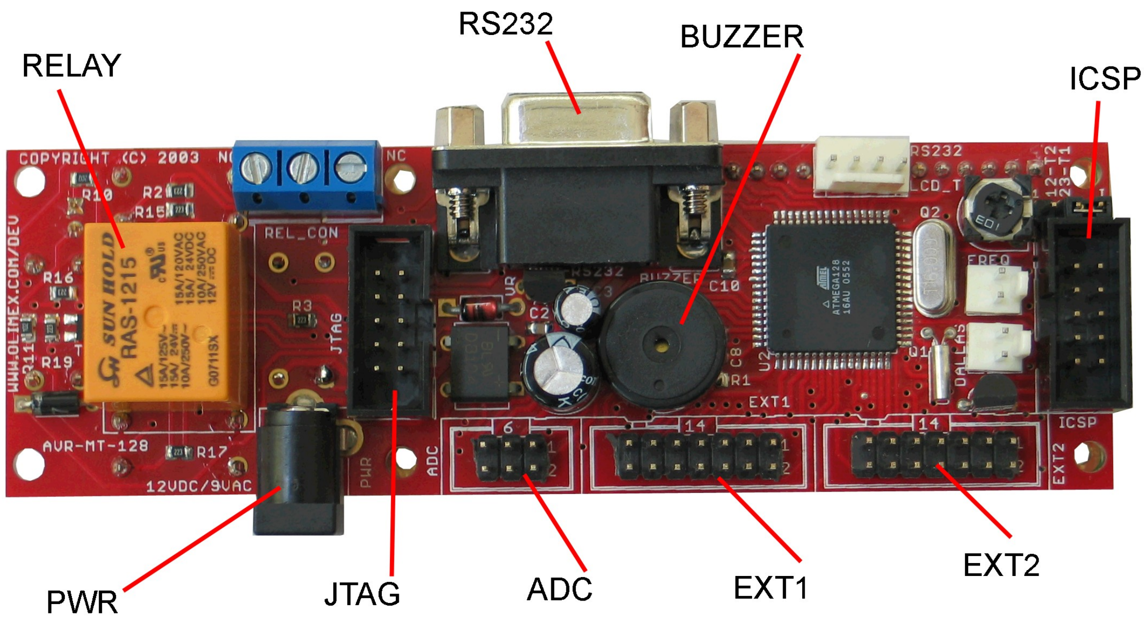


MEMORY MAP:

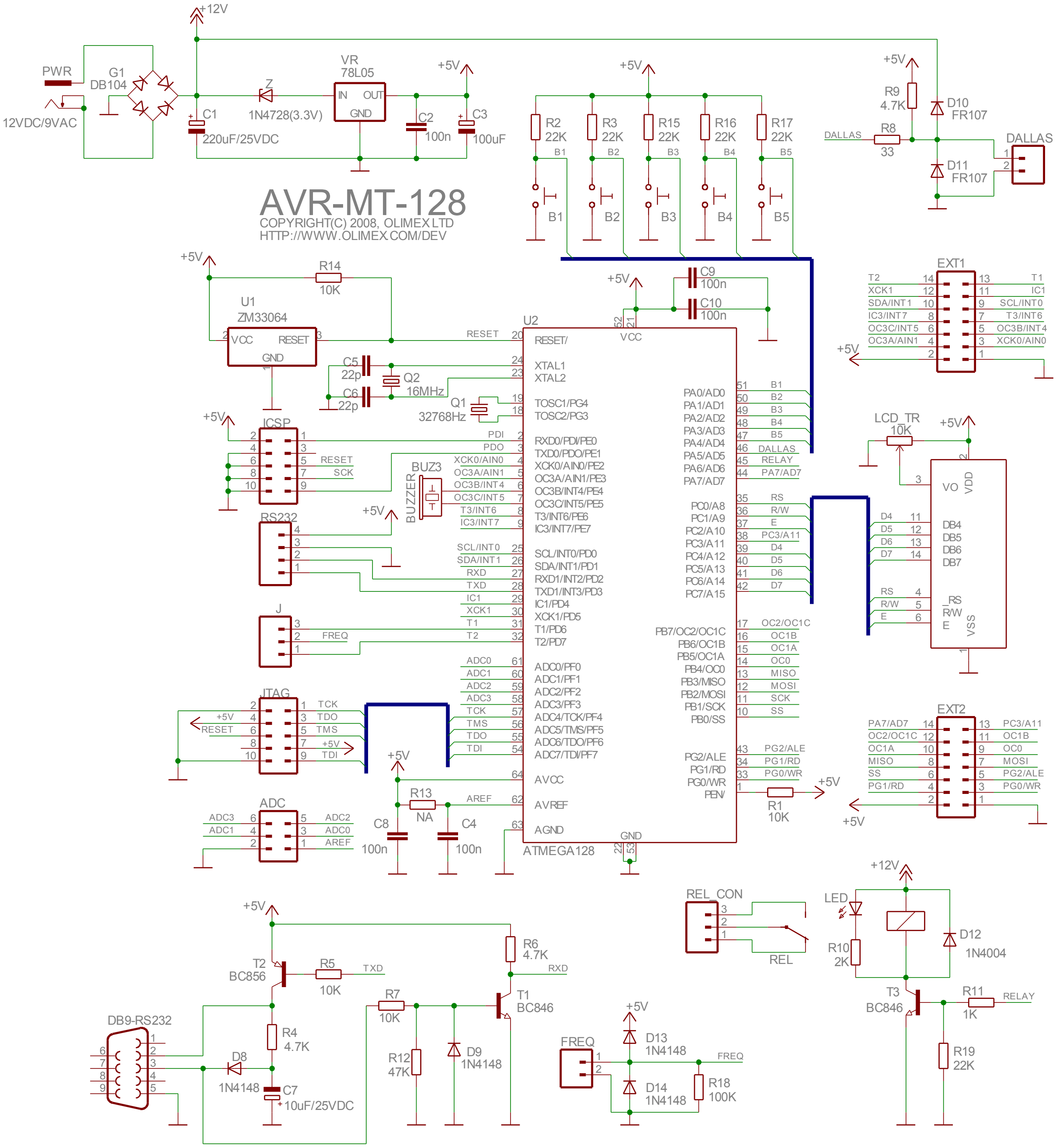




BOARD LAYOUT:



SCHEMATIC:



AVR-MT-128
COPYRIGHT(C) 2008, OLIMEX LTD
HTTP://WWW.OLIMEX.COM/DEV
PWR
12VDC/9VAC
G1
DB104
+12V
VR
78L05
IN
OUT
GND
Z
1N4728(3.3V)
C1
220uF/25VDC
C2
100n
C3
100uF
+5V
R2
22K
R3
22K
R15
22K
R16
22K
R17
22K
B1
B2
B3
B4
B5
R9
4.7K
D10
FR107
R8
33
DALLAS
D11
FR107
R14
10K
U1
ZM33064
VCC
RESET
GND
C5
22p
C6
22p
Q2
16MHz
Q1
32768Hz
C9
100n
C10
100n
U2
ATMEGA128
EXT1
EXT2
ICSP
BUZ3
BUZZER
RS232
J
FREQ
JTAG
ADC
LCD_TR
10K
R13
NA
C8
100n
C4
100n
R1
10K
REL_CON
REL
LED
R10
2K
D12
1N4004
T3
BC846
R11
1K
RELAY
R19
22K
T2
BC856
R5
10K
TXD
R6
4.7K
RXD
T1
BC846
R7
10K
R12
47K
D9
1N4148
R4
4.7K
D8
1N4148
C7
10uF/25VDC
DB9-RS232
D13
1N4148
D14
1N4148
R18
100K

POWER SUPPLY CIRCUIT:

The power supply of AVR-MT128 is taken from Power jack connector. You should apply 9 VAC or +12 VDC at the positive central pin.
The consumption of the board is about 30 mA.

RESET CIRCUIT:

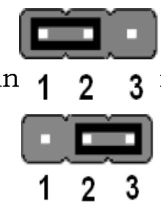
AVR-MT128 reset circuit is made with ZM33064 with typical threshold 4.5V. When the voltage falls bellow that minimum, the MSU resets.

CLOCK CIRCUIT:

Quartz crystal 16MHz for maximum performance is connected to ATMega128 pin 23 (XTAL2) and pin 24 (XTAL1).
Additional 32 768 Hz tact generator is connected to ATMega128 pin 18 (TOSC2/PG3) and pin 19 (TOSC1/PG4) and supplies the Real Time Clock.

JUMPER DESCRIPTION:

J



This jumper supplies the input user frequency FREQ to either pin 31 (T1/PD6) or pin 32 (T2/PD7). When 1-2 is shorted the input frequency pin is connected to T2. When 2-3 is shorted the input frequency pin is connected to T1.

Default state is 1-2 shorted.

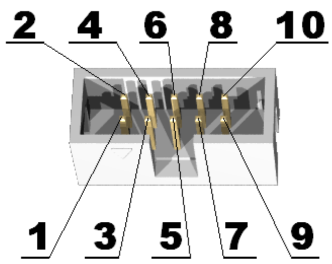
INPUT/OUTPUT:

Status LED (red) connected to the relay.
Relay with name **REL** connected to ATMega128 pin 45 (PA6/AD6).
Trimmer LED_TR connected to the LCD.
Liquid crystal display.
Buzzer with name **BUZZ** connected to ATMega128 pin 6 (OC3B/INT4/PE4) and pin 7 (OC3C/INT5/PE5).
User button B1 connected to ATMega128 pin 51 (PA0/AD0).
User button B2 connected to ATMega128 pin 50 (PA1/AD1).
User button B3 connected to ATMega128 pin 49 (PA2/AD2).
User button B4 connected to ATMega128 pin 48 (PA3/AD3).
User button B5 connected to ATMega128 pin 47 (PA4/AD4).

CONNECTOR DESCRIPTIONS:

JTAG:

Pin #	Signal Name
1	TCK
2	GND
3	TDO
4	+5V
5	TMS
6	RESET
7	+5V
8	NC
9	TDI
10	GND

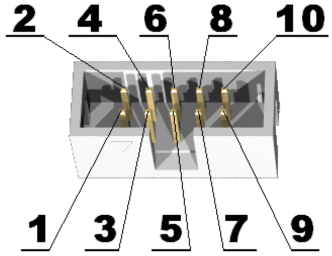


This connector allows programming and debugging via AVR-JTAG or other compatible tools.

TDI Input **Test Data In**. This is the serial data input for the shift register.
TDO Output**Test Data Out**. This is the serial data output for the shift register. Data is shifted out of the device on the negative edge of the TCK signal.
TMS Input **Test Mode Select**. The TMS pin selects the next state in the TAP state machine.
TCK Input **Test Clock**. This allows shifting of the data in, on the TMS and TDI pins. It is a positive edge triggered clock with the TMS and TCK signals that define the internal state of the device.

ICSP:

Pin #	Signal Name
1	PDI
2	+5V
3	NC
4	GND
5	RST
6	GND



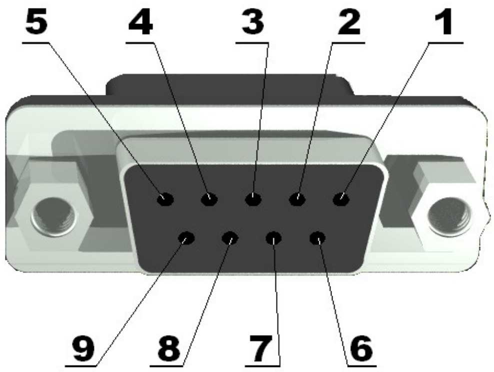
7	SCK
8	GND
9	PDO
10	GND

This connector allows programming via AVR-PG1, AVR-PG2 or other compatible tool.

PDI Input **Program Data In.** This pin is serial data input for the MCU.
PDO Output **Program Data Out.** This pin is serial data output from the MCU.
SCK I/O **Serial (Synchronization) Clock.** This is the synchronization signal.

DB9-RS232:

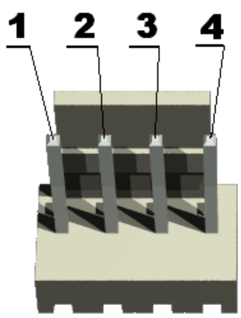
Pin #	Signal Name
1	NC
2	TXD
3	RXD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC



TXD Output **Transmit Data.** This is the asynchronous serial data output for the RS232 interface.
RXD Input **Receive Data.** This is the asynchronous serial data input for the RS232 interface.

RS232:

Pin #	Signal Name
1	TXD
2	RXD
3	GND



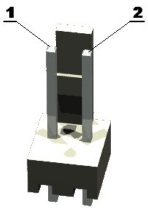
4	+5V

RELAY CONNECTOR:



This connector provides the user with access to the contact plates of the relay.

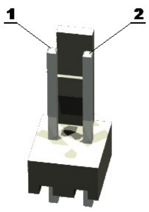
FREQ:



Pin #	Signal Name
1	FREQ
2	GND

External input frequency is applied at pin 1.

DALLAS:

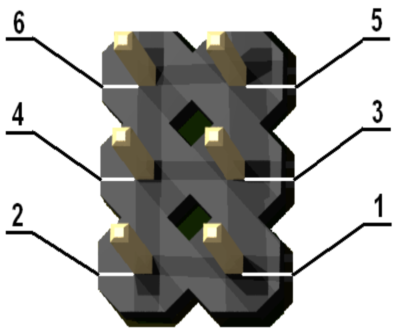


Pin #	Signal Name
1	DALLAS
2	GND

Signal from Dallas chips is applied at pin 1 of the Dallas interface.

ADC:

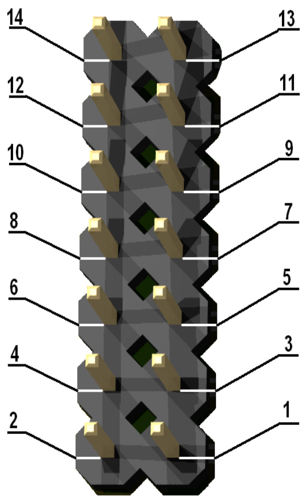
Pin #	Signal Name
1	AREF
2	GND
3	ADC0
4	ADC1
5	ADC2
6	ADC3



Some of the Analog to Digital Converter signals are grouped into an extension.

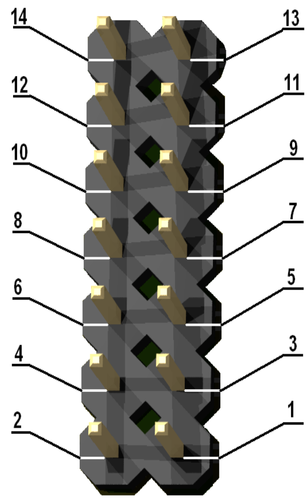
EXT1:

Pin #	Signal Name
1	GND
2	+5V
3	XCK0/AIN0
4	OC3A/AIN1
5	OC3B/INT4
6	OC3C/INT5
7	T3/INT6
8	IC3/INT7
9	SCL/INT0
10	SDA/INT1
11	IC1
12	XCK1
13	T1
14	T2



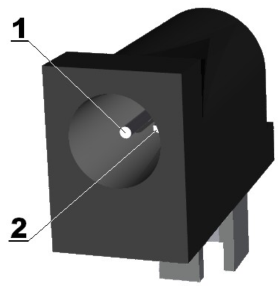
EXT2:

Pin #	Signal Name
1	GND
2	+5V
3	PG0/WR
4	PG1/RD
5	PG2/ALE
6	SS
7	MOSI
8	MISO
9	OC0
10	OC1A
11	OC1B
12	OC2/OC1C
13	PC3/A11
14	PA7/AD7



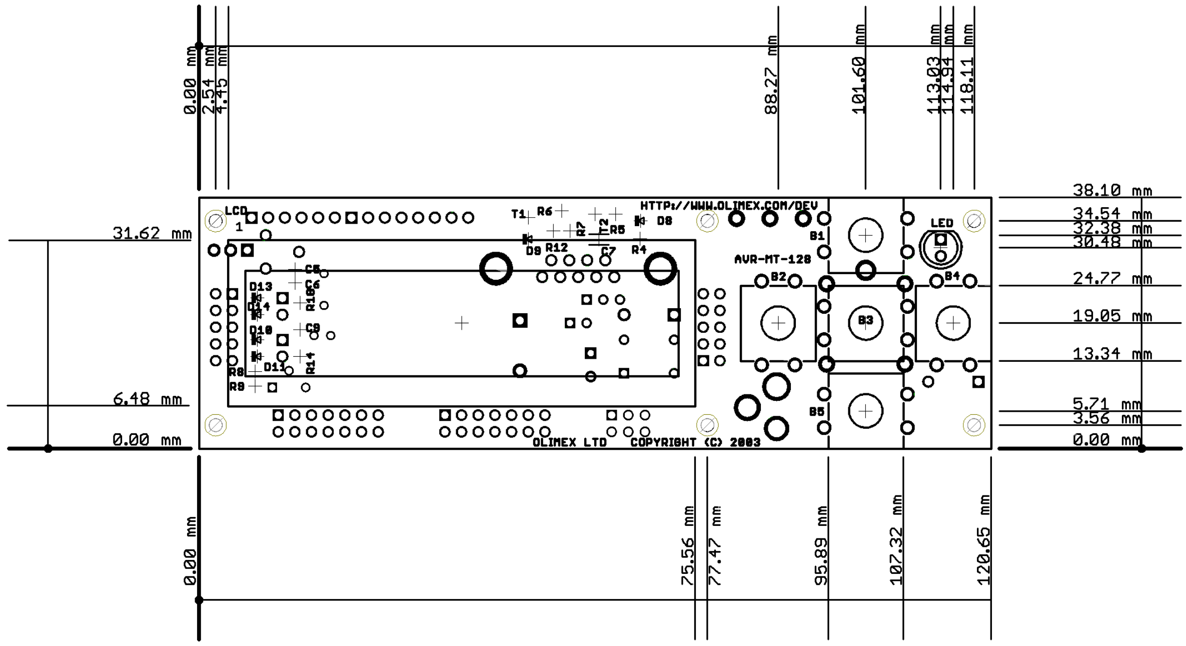
PWR:

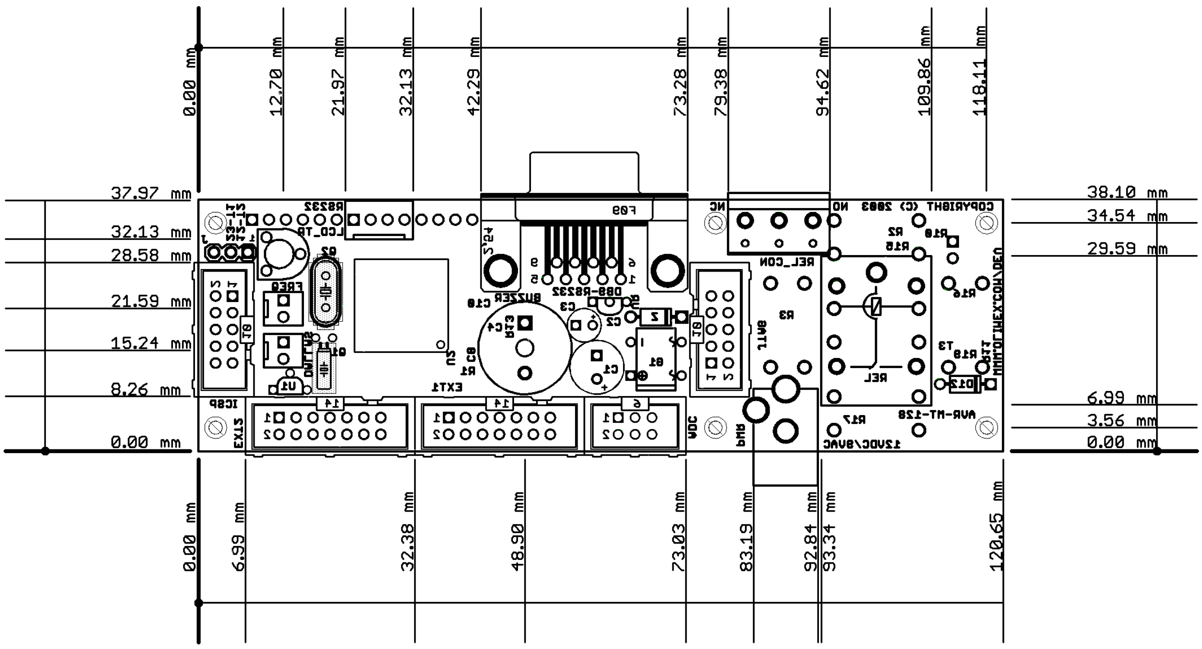
Pin #	Signal Name
1	PWR
2	GND



You should apply 9 VAC or +12VDC on pin 1.

MECHANICAL DIMENSIONS:





All measures are in mm.

AVAILABLE DEMO SOFTWARE:

Check for available demo software for **AVR-MT128** on our website: www.olimex.com/dev.

ORDER CODE:

AVR-MT128 – assembled and tested (no kit, no soldering required)

How to order?
You can order to us directly or by any of our distributors.
Check our web www.olimex.com/dev for more info.

All boards produced by Olimex are ROHS compliant

Revision history:

REV.A - created September 2008

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